

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-305615

(43)Date of publication of application : 22.11.1996

(51)Int.Cl.

G06F 12/00

(21)Application number : 07-136218

(71)Applicant : OKI ELECTRIC IND CO LTD

(22)Date of filing : 10.05.1995

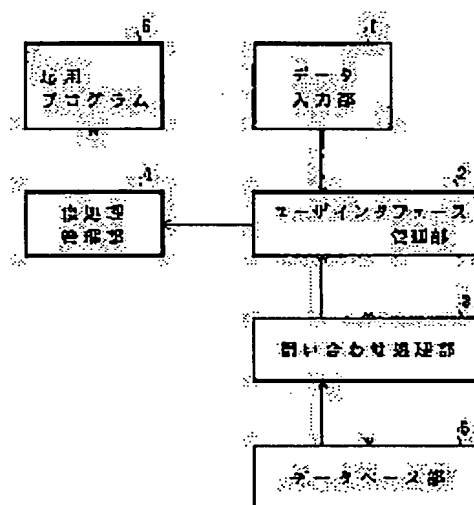
(72)Inventor : SUGAI TAKESHI

(54) DATA BASE INQUIRY SYSTEM

(57)Abstract:

PURPOSE: To attain the easy use of a data base even with an application program that does not presume the use of the data base.

CONSTITUTION: A data input part 1 inputs an inquiry statement of SQL and a format designation statement which designates the data format of an application program. An inquiry processing part 3 performs the syntactic analysis of the inquiry statement and sends the SQL inquiry statement to a data base part 5 as long as the statement is correct. The part 5 performs a retrieval operation in response to the inquiry statement. A post-processing management part 4 converts the result retrieved by the part 5 into the format of the application program based on the format designation statement inputted by the part 1. Then the part 4 sends the converted format to the application program.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] The data input section which inputs the format assignment sentence which specifies the data format of the application program which uses the retrieval data of the database for retrieval while inputting the inquiry sentence of SQL, The database section which searches a database based on the inquiry sentence of SQL inputted into said data input section, and outputs the retrieval result, The database inquiry system characterized by having the after-treatment Management Department which changes said retrieval result into a format of said application program based on said format assignment sentence, and outputs to the application program concerned.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the database inquiry system into which the method of a display of a retrieval result was changed according to a display demand of a user.

[0002]

[Description of the Prior Art] Inquiry language called SQL was prepared in the relational database system. Moreover, also in object-oriented database system, it is common that inquiry language called the object SQL which extended SQL is prepared.

[0003] SQL is the language with which a data definition operation and a data manipulation operation can be expressed, and there are retrieval and an updating operation as data manipulation operation. Here, a retrieval operation is explained. A retrieval operation is expressed by the following formulas.

select a₁, —, a_k from R₁, —, R_m where p — here — R_i It is relation and is the relation searched (j= 1, —, m). a_i is the attribute of these relation, is drawn as a result, and calls this a target attribute (i= 1, —, k). Moreover, a₁, —, a_k It is called a target list. p is conditional expression. Conditional expression consists of the following basic type, athetab or athetav, an AND (AND) of conditional expression, an OR (OR) of conditional expression, or negation (NOT) of conditional expression. a and b are the attributes in the relation searched here, and v is a constant. theta is a relational operator (< — <=, =, >=, >, and !=). Moreover, above-mentioned athetab is called joint basic type, and athetav is called limit type.

[0004]

[Problem(s) to be Solved by the Invention] However, the following thing is mentioned as a trouble of an inquiry of the database by the conventional SQL. When an application program used a database conventionally, how to embed SQL at the programming language of the application program was used. That is, utilization of a database needed to be developed for the application program itself as a premise. For this reason, the existing application program which has not assumed the activity of a database beforehand was not able to use the data of a database.

[0005] From such a point, even if it was the application program which does not assume the activity of a database, database inquiry system implementation which can use a database easily was desired.

[0006]

[Means for Solving the Problem] In order that the database inquiry system of this invention may solve the above-mentioned technical problem, it is what adopted the mechanism which put in after treatment into the inquiry sentence of a database at consideration, and realizes this by the following configurations. Namely, the database inquiry system of this invention The data input section which inputs the inquiry sentence of SQL, and the format assignment sentence which specifies the data format of the application program which uses the retrieval data of the database for retrieval, The database section which searches a database based on the inquiry sentence of SQL inputted into this data input section, and outputs that retrieval result, A retrieval result is changed into a format of an application program based on a format assignment sentence, and it is characterized by having the after-treatment Management Department which

outputs to the application program.

[0007]

[Function] In the database inquiry system of this invention, if the inquiry sentence of SQL and the format assignment sentence which specifies the data format of an application program are inputted into the data input section, the database section will search a database based on the inquiry sentence of the SQL. If a retrieval result is obtained, the after-treatment Management Department will make a retrieval result the data format corresponding to the format assignment sentence into which it was inputted by the data input section, and will output to an application program.

[0008]

[Example] Hereafter, the example of this invention is explained to a detail using a drawing.

Drawing 1 is database inquiry structure-of-a-system drawing of the example of this invention.

The system of drawing consists of the data input section 1, the user interface Management Department 2, the inquiry processing section 3, the after-treatment Management Department 4, the database section 5, and an application program 6.

[0009] The data input section 1 is equipment which it consists of input devices in a computer system, such as a keyboard and a mouse, and a user inputs the command for database retrieval using these input devices, and supplies this to the user interface Management Department 2. The user interface Management Department 2 has the function which supplies the data for displaying a retrieval result and the content of browsing to an application program 6 while receiving the command from the data input section 1. A user inputted and asks the inquiry processing section 3, and it inspects a sentence in the right in functor. If not right, it is made to display on the display which does not illustrate the message of an error to a user through the user interface Management Department 2, and if right, it is constituted so that a user's inquiry sentence may be supplied to the database section 5.

[0010] According to the format assignment sentence written to inquiry language, the after-treatment Management Department 4 changes retrieval data into an output form, and outputs to an application program 6. The database section 5 consists of relational database systems. An application program 6 is an application program called a spreadsheet program, and displays the display of the searched data (a text, an image, graphics, etc.), and the data of browsing.

[0011] Next, actuation of the database inquiry system of the above-mentioned configuration is explained. Drawing 2 is the operation flow chart of the database inquiry system of this invention.

<Step S1> A user goes into the mode of retrieval of a database, when the database section 5 (database system) starts by the invocation command.

<Step S2> When a user asks, a sentence is inputted and the inquiry processing section 3 starts by the invocation command, activation of the inquiry processing section 3 starts. An inquiry sentence is expressed by the following formulas.

[0012]

for Fselect a1, —, akfrom R1, —, Rmwhere P [0013] Here, the select phrase, the from phrase, and the where phrase are based on the syntax of general SQL. If this is explained briefly, they are R1 and Rm. It is the relation drawn. Moreover, a1, —, ak are the attributes of these relation, and are drawn as a result. Furthermore, P is conditional expression. Moreover, a for phrase is a format assignment sentence and is a phrase introduced for the inquiry of a database in consideration of after treatment. This describes the program for specifying a format of application.

[0014] <Step S3> It asks, and the inquiry processing section 3 analyzes syntax about a sentence, and it inspects [which was inputted at step S2] whether the functor of inquiry language is suited.

<Step S4> It inspects [which was inputted at step S2] whether it asks and the inquiry processing section 3 is filling the schema of a database about the sentence. Here, the schema of database system is an eternal logical thing time in the DS of a database.

[0015] <Step S5> Based on a rewriting rule, an activation plan is generated about the inquiry sentence by the side of the system generated at step S2.

<Step S6> An activation plan is performed according to the activation plan generated at step S5.

On the occasion of activation, retrieval is performed by calling the executive function of the database section 5.

<Step S7> The inquiry processing section 3 passes the after-treatment Management Department 4 the data searched with step S6 through the user interface Management Department 2. The after-treatment Management Department 4 changes the passed data into a format of a for phrase.

[0016] <Step S8> An application program 6 displays the data of a format changed at the after-treatment Management Department 4 on a user.

<Step S9> It judges whether a user asks and a sentence is inputted again. If it inputs again, processing after step S3 will be performed. On the other hand, if a termination carbon button is pushed, the search mode of a database will be ended.

[0017] <Step S10> If a user's inquiry sentence is an error in functor or an error in semantics (tic [SEMAN]) compared with the schema of a database, the inquiry processing section 3 will tell the user interface Management Department 2 about being an error. The user interface Management Department 2 informs a user of being a syntax error or a semantic error.

[0018] Next, the actuation mentioned above is further explained using an example. Drawing 3 is the explanatory view of the schema structure of a database. Here, all the data in the database section presuppose that it is English. obase, geosBib, and bibs are the meetings of the data of reference data. obase In the schema structure to say, the attribute of author, title, publication, abstract, year, and text is included. Moreover, geosBib In the schema structure to say, the attribute of author, organization, title, publication, comment, year, and text is included. Moreover, in the schema structure of bibs, the attribute of author, organization, title, publication, keyword, year, and text is included. In addition, text is an attribute which shows the body of a paper.

[0019] <Activation actuation 1> A user asks and a sentence is inputted. Drawing 4 is the explanatory view of the inquiry input screen. This example shows the retrieval to the reference published in the 1989 fiscal year. Moreover, it specifies that it is "HTML" as the for phrase. This shows that the process which passes the data searched from the database section to an interface in the form of HTML is started. In addition, HTML is a format of the format that an application program 6 is acceptable.

[0020] When it writes by the syntax of SQL, specifically, having carried out the following inquiries is shown.

for "HTML" select * from id in bibs where id.year = "1989" [0021] <Activation actuation 2> In drawing 4, if a user pushes the carbon button of "Query Start", the above-mentioned step S3 and step S4 will be performed, and it will confirm whether to be an error functor-wise or semantically.

<Activation actuation 3> According to assignment of a deed and a for phrase, data are displayed for step S5 and step S6. Drawing 5 is an output at this time, and is the explanatory view of a retrieval screen.

[0022] Next, activation actuation 1 mentioned above A user changes only description of a for phrase and how to display data is shown.

<Activation actuation 4> Activation actuation 1 It is referred to as "tex" instead of "HTML" of a for phrase. In addition, it is the format of a format like HTML with this "tex."

<Activation actuation 5> If a user pushes the carbon button of "Query Start", step S3 and step S4 will be performed and it will confirm whether to be an error functor-wise or semantically.

<Activation actuation 6> According to assignment of a deed and a for phrase, data are displayed for step S5 and step S6. at this time, data are orthopedically operated in the form of "tex" — the program of tex is performed, the previewer of tex is performed and it is displayed as follows. Drawing 6 is an output at this time.

[0023] As mentioned above, according to the above-mentioned example, after treatment is asked, and it embeds in language, and is inquiry language. The result of an inquiry can be changed by changing an output destination change with a for phrase. Moreover, the existing application program without the access means against a database can be used by changing the result of an inquiry into the form where it can input into the existing application program, and specifying the existing program and the program which performs an exchange of data as after

treatment.

[0024] In addition, although the database section 5 explained the example which is a relational database system in the above-mentioned example, the same effectiveness can be done so even if a database is an object oriented database.

[0025] moreover, in the above-mentioned example, "HTML" is specified as a for phrase, and although the example which outputted the output to HTML was shown, the program transformation program changed into the format used for a for phrase with an application program is created — it can be adapted also for various data format by specifying the program as a for phrase.

[0026] Furthermore, in order to perform format conversion to an application program 6, the after-treatment Management Department 4 was formed independently, but you may constitute from an above-mentioned example so that the inquiry processing section 3 may include the function of this after-treatment Management Department 4. That is, a user may specify the format changed, and the inquiry processing section 3 may constitute so that it may change into the format which had the retrieval result specified at the time of retrieval activation.

[0027]

[Effect of the Invention] Since a format of the application program using a retrieval result is inputted with the inquiry sentence of a database, the after-treatment Management Department changes a retrieval result into a format of an application program based on this format assignment sentence and it was made to output according to the database inquiry system of this invention as explained above, even if it is the application program which does not assume the activity of a database, a database can be used easily.

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PRIOR ART

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[0003] SQL is the language with which a data definition operation and a data manipulation operation can be expressed, and there are retrieval and an updating operation as data manipulation operation. Here, a retrieval operation is explained. A retrieval operation is expressed by the following formulas.

select a_1, \dots, a_k from R_1, \dots, R_m where p — here — R_i It is relation and is the relation searched ($j = 1, \dots, m$). a_i is the attribute of these relation, is drawn as a result, and calls this a target attribute ($i = 1, \dots, k$). Moreover, a_1, \dots, a_k It is called a target list. p is conditional expression. Conditional expression consists of the following basic type, athetab or athetav , an AND (AND) of conditional expression, an OR (OR) of conditional expression, or negation (NOT) of conditional expression. a and b are the attributes in the relation searched here, and v is a constant. θ is a relational operator ($< \text{---} \leq, =, \geq, >$, and \neq). Moreover, above-mentioned athetab is called joint basic type, and athetav is called limit type.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, the following thing is mentioned as a trouble of an inquiry of the database by the conventional SQL. When an application program used a database conventionally, how to embed SQL at the programming language of the application program was used. That is, utilization of a database needed to be developed for the application program itself as a premise. For this reason, the existing application program which has not assumed the activity of a database beforehand was not able to use the data of a database. [0005] From such a point, even if it was the application program which does not assume the activity of a database, database inquiry system implementation which can use a database easily was desired.

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MEANS

[Means for Solving the Problem] In order that the database inquiry system of this invention may solve the above-mentioned technical problem, it is what adopted the mechanism which put in after treatment into the inquiry sentence of a database at consideration, and realizes this by the following configurations. That is, this invention is characterized by providing the following to a database inquiry system. The inquiry sentence of SQL The data input section which inputs the format assignment sentence which specifies the data format of the application program which uses the retrieval data of the database for retrieval The database section which searches a database based on the inquiry sentence of SQL inputted into this data input section, and outputs that retrieval result The after-treatment Management Department which changes a retrieval result into a format of an application program based on a format assignment sentence, and outputs to the application program

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OPERATION

[Function] In the database inquiry system of this invention, if the inquiry sentence of SQL and the format assignment sentence which specifies the data format of an application program are inputted into the data input section, the database section will search a database based on the inquiry sentence of the SQL. If a retrieval result is obtained, the after-treatment Management Department will make a retrieval result the data format corresponding to the format assignment sentence into which it was inputted by the data input section, and will output to an application program.

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EXAMPLE

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[0010] According to the format assignment sentence written to inquiry language, the after-treatment Management Department 4 changes retrieval data into an output form, and outputs to an application program 6. The database section 5 consists of relational database systems. An application program 6 is an application program called a spreadsheet program, and displays the display of the searched data (a text, an image, graphics, etc.), and the data of browsing.

[0011] Next, actuation of the database inquiry system of the above-mentioned configuration is explained. Drawing 2 is the operation flow chart of the database inquiry system of this invention.

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<Step S2> When a user asks, a sentence is inputted and the inquiry processing section 3 starts by the invocation command, activation of the inquiry processing section 3 starts. An inquiry sentence is expressed by the following formulas.

[0012]

for Fselect a1, —, ak from R1, —, Rm where P [0013] Here, the select phrase, the from phrase, and the where phrase are based on the syntax of general SQL. If this is explained briefly, they are R1 and Rm. It is the relation drawn. Moreover, a1, —, ak are the attributes of these relation, and are drawn as a result. Furthermore, P is conditional expression. Moreover, a for phrase is a format assignment sentence and is a phrase introduced for the inquiry of a database in consideration of after treatment. This describes the program for specifying a format of application.

[0014] <Step S3> It asks, and the inquiry processing section 3 analyzes syntax about a sentence, and it inspects [which was inputted at step S2] whether the functor of inquiry language is suited.

<Step S4> It inspects [which was inputted at step S2] whether it asks and the inquiry processing section 3 is filling the schema of a database about the sentence. Here, the schema of database system is an eternal logical thing time in the DS of a database.

[0015] <Step S5> Based on a rewriting rule, an activation plan is generated about the inquiry sentence by the side of the system generated at step S2.

<Step S6> An activation plan is performed according to the activation plan generated at step S5. On the occasion of activation, retrieval is performed by calling the executive function of the database section 5.

<Step S7> The inquiry processing section 3 passes the after-treatment Management Department 4 the data searched with step S6 through the user interface Management Department 2. The after-treatment Management Department 4 changes the passed data into a format of a for phrase.

[0016] <Step S8> An application program 6 displays the data of a format changed at the after-treatment Management Department 4 on a user.

<Step S9> It judges whether a user asks and a sentence is inputted again. If it inputs again, processing after step S3 will be performed. On the other hand, if a termination carbon button is pushed, the search mode of a database will be ended.

[0017] <Step S10> If a user's inquiry sentence is an error in functor or an error in semantics (tic [SEMAN]) compared with the schema of a database, the inquiry processing section 3 will tell the user interface Management Department 2 about being an error. The user interface Management Department 2 informs a user of being a syntax error or a semantic error.

[0018] Next, the actuation mentioned above is further explained using an example. Drawing 3 is the explanatory view of the schema structure of a database. Here, all the data in the database section presuppose that it is English. obase, geosBib, and bibs are the meetings of the data of reference data. obase In the schema structure to say, the attribute of author, title, publication, abstract, year, and text is included. Moreover, geosBib In the schema structure to say, the attribute of author, organization, title, publication, comment, year, and text is included. Moreover, in the schema structure of bibs, the attribute of author, organization, title, publication, keyword, year, and text is included. In addition, text is an attribute which shows the body of a paper.

[0019] <Activation actuation 1> A user asks and a sentence is inputted. Drawing 4 is the explanatory view of the inquiry input screen. This example shows the retrieval to the reference published in the 1989 fiscal year. Moreover, it specifies that it is "HTML" as the for phrase. This shows that the process which passes the data searched from the database section to an interface in the form of HTML is started. In addition, HTML is a format of the format that an application program 6 is acceptable.

[0020] When it writes by the syntax of SQL, specifically, having carried out the following inquiries is shown.

for"HTML"select *from id in bibswhere id.year ="1989" [0021] <Activation actuation 2> In drawing 4 , if a user pushes the carbon button of "Query Start", the above-mentioned step S3 and step S4 will be performed, and it will confirm whether to be an error functor-wise or semantically.

<Activation actuation 3> According to assignment of a deed and a for phrase, data are displayed for step S5 and step S6. Drawing 5 is an output at this time, and is the explanatory view of a retrieval screen.

[0022] Next, activation actuation 1 mentioned above A user changes only description of a for phrase and how to display data is shown.

<Activation actuation 4> Activation actuation 1 It is referred to as "tex" instead of "HTML" of a for phrase. In addition, it is the format of a format like HTML with this "tex."

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[0023] As mentioned above, according to the above-mentioned example, after treatment is asked, and it embeds in language, and is inquiry language. The result of an inquiry can be changed by changing an output destination change with a for phrase. Moreover, the existing

application program without the access means against a database can be used by changing the result of an inquiry into the form where it can input into the existing application program, and specifying the existing program and the program which performs an exchange of data as after treatment.

[0024] In addition, although the database section 5 explained the example which is a relational database system in the above-mentioned example, the same effectiveness can be done so even if a database is an object oriented database.

[0025] moreover, in the above-mentioned example, "HTML" is specified as a for phrase, and although the example which outputted the output to HTML was shown, the program transformation program changed into the format used for a for phrase with an application program is created — it can be adapted also for various data format by specifying the program as a for phrase.

[0026] Furthermore, in order to perform format conversion to an application program 6, the after-treatment Management Department 4 was formed independently, but you may constitute from an above-mentioned example so that the inquiry processing section 3 may include the function of this after-treatment Management Department 4. That is, a user may specify the format changed, and the inquiry processing section 3 may constitute so that it may change into the format which had the retrieval result specified at the time of retrieval activation.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is database inquiry structure-of-a-system drawing of this invention.

[Drawing 2] It is the operation flow chart of the database inquiry system of this invention.

[Drawing 3] It is the explanatory view of the schema structure of the database in the database inquiry system of this invention.

[Drawing 4] It is the explanatory view of the inquiry input screen in the database inquiry system of this invention.

[Drawing 5] It is the explanatory view of the retrieval screen in the database inquiry system of this invention.

[Drawing 6] It is the explanatory view of the retrieval output screen in other formats in the database inquiry system of this invention.

[Description of Notations]

1 Data Input Section

3 Inquiry Processing Section

4 After-Treatment Management Department

5 Database Section

6 Application Program

[Translation done.]

(19)日本国特許庁 (J P)

(12) 公 開 特 許 公 報 (A)

(11)特許出願公開番号

特開平8-305615

(43)公開日 平成8年(1996)11月22日

(51)Int.Cl. ⁶	識別記号	庁内整理番号	F I	技術表示箇所
G 0 6 F 12/00	5 1 3	7623-5B	G 0 6 F 12/00	5 1 3 D

審査請求 未請求 請求項の数 1 F D (全 7 頁)

(21)出願番号 特願平7-136218

(22)出願日 平成7年(1995)5月10日

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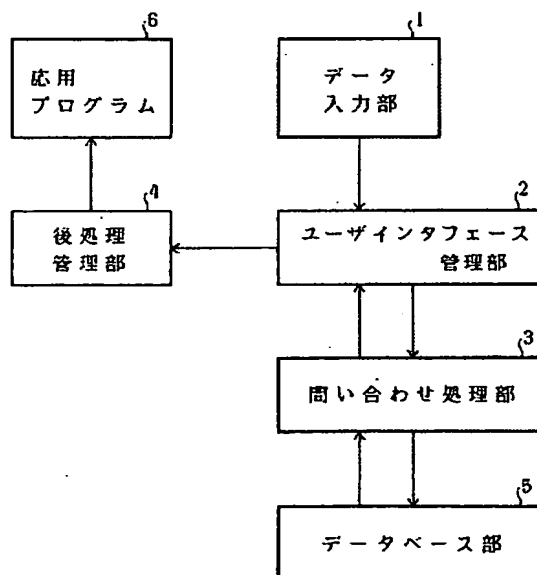
(74)代理人 弁理士 佐藤 幸男 (外1名)

(54)【発明の名称】 データベース問い合わせシステム

(57)【要約】

【目的】 データベースの使用を想定していないアプリケーションでも容易にデータベースを使用することができるようにする。

【構成】 データ入力部1は、SQLの問い合わせ文と、アプリケーションのデータフォーマットを指定するフォーマット指定文を入力する。問い合わせ処理部3は、これらの問い合わせ文の構文分析を行い、正しい場合はSQLの問い合わせ文をデータベース部5に渡す。データベース部5は、問い合わせ文に対応した検索を行う。後処理管理部4は、データベース部5によって検索された結果を、データ入力部1で入力されたフォーマット指定文に基づき、アプリケーションのフォーマットに変換してアプリケーションに渡す。



本発明システムの構成部

【特許請求の範囲】

【請求項1】 SQLの問い合わせ文を入力すると共に、検索対象のデータベースの検索データを使用する応用プログラムのデータフォーマットを指定するフォーマット指定文を入力するデータ入力部と、前記データ入力部に入力されたSQLの問い合わせ文に基づいてデータベースの検索を行い、その検索結果を出力するデータベース部と、前記検索結果を前記フォーマット指定文に基づき、前記応用プログラムのフォーマットに変換し、当該応用プログラムに対して出力する後処理管理部とを備えたことを特徴とするデータベース問い合わせシステム。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、ユーザの表示要求に合わせて、検索結果の表示の仕方を変えるようにしたデータベース問い合わせシステムに関するものである。

【0002】

【従来の技術】 リレーショナルデータベースシステムでは、SQLという問い合わせ言語が用意されていた。また、オブジェクト指向データベースシステムにおいても、SQLを拡張したオブジェクトSQLという問い合わせ言語が用意されているのが一般的である。

【0003】 SQLは、データ定義演算とデータ操作演算を表せる言語であり、データ操作演算には、検索と更新演算がある。ここでは、検索演算について説明する。検索演算は、以下の式により表現される。

$\text{select } a_1, \dots, a_k \text{ from } R_1, \dots, R_m \text{ where } p$

ここで、 R_i は関係であり、検索される関係である ($i = 1, \dots, m$)。 a_i はこれらの関係の属性で、結果として導出されるものであり、これを目標属性という ($i = 1, \dots, k$)。また、 a_1, \dots, a_k を目標リストという。 p は条件式である。条件式は、次の基本式、

$a \theta b$ または $a \theta v$

あるいは、条件式の論理積 (AND)、あるいは、条件式の論理和 (OR)、あるいは、条件式の否定 (NOT) から構成される。ここで、 a と b は、検索される関係内の属性であり、 v は定数である。 θ は、比較演算子 ($<, \leq, =, \geq, >, \neq$) である。また、上記の $a \theta b$ を結合基本式、 $a \theta v$ を制限式という。

【0004】

【発明が解決しようとする課題】 しかしながら、従来のSQLによるデータベースの問い合わせの問題点として、次のことが挙げられる。従来、応用プログラムがデータベースを利用する場合、その応用プログラムのプログラム言語にSQLを埋め込むといった手法を用いていた。即ち、応用プログラムそのものをデータベースの利用を前提として開発する必要があった。このため、予めデータベースの使用を想定していない既存の応用プログラムは、データベースのデータを利用することができな

かった。

【0005】 このような点から、データベースの使用を想定していない応用プログラムであってもデータベースの利用を容易に行うことのできるデータベース問い合わせシステムの実現が望まれていた。

【0006】

【課題を解決するための手段】 本発明のデータベース問い合わせシステムは、上記の課題を解決するため、データベースの問い合わせ文の中に後処理を考慮にいったメカニズムを取り入れるようにしたもので、これを以下の構成によって実現する。即ち、本発明のデータベース問い合わせシステムは、SQLの問い合わせ文と、検索対象のデータベースの検索データを使用する応用プログラムのデータフォーマットを指定するフォーマット指定文とを入力するデータ入力部と、このデータ入力部に入力されたSQLの問い合わせ文に基づいてデータベースの検索を行い、その検索結果を出力するデータベース部と、検索結果をフォーマット指定文に基づき応用プログラムのフォーマットに変換し、その応用プログラムに対して出力する後処理管理部とを備えたことを特徴とするものである。

【0007】

【作用】 本発明のデータベース問い合わせシステムにおいては、データ入力部にSQLの問い合わせ文と、応用プログラムのデータフォーマットを指定するフォーマット指定文とが入力されると、データベース部は、そのSQLの問い合わせ文に基づきデータベースの検索を行う。検索結果が得られると、後処理管理部は、検索結果をデータ入力部に入力されたフォーマット指定文に対応したデータフォーマットとし、応用プログラムに出力する。

【0008】

【実施例】 以下、本発明の実施例を図面を用いて詳細に説明する。図1は、本発明の実施例のデータベース問い合わせシステムの構成図である。図のシステムは、データ入力部1、ユーザインタフェース管理部2、問い合わせ処理部3、後処理管理部4、データベース部5、応用プログラム6からなる。

【0009】 データ入力部1は、コンピュータシステムにおけるキーボードやマウス等の入力装置からなり、ユーザがこれらの入力装置を利用してデータベース検索のためのコマンドを入力し、これをユーザインタフェース管理部2に供給する装置である。ユーザインタフェース管理部2は、データ入力部1からのコマンドを受け付けると共に、検索結果やブラウジング内容を表示するためのデータを応用プログラム6へ供給する機能を有している。問い合わせ処理部3は、ユーザが入力した問い合わせ文を構文的に正しいか検査する。もし、正しくなければ、ユーザインタフェース管理部2を通じて、ユーザにエラーのメッセージを図示しないディスプレイに表示さ

せ、正しければ、データベース部5にユーザの問い合わせ文を供給するよう構成されている。

【0010】後処理管理部4は、問い合わせ言語に書かれたフォーマット指定文に従い、検索データを出力形式に変換して応用プログラム6に出力するものである。データベース部5は、関係データベースシステムで構成されている。応用プログラム6は、例えば表計算プログラムといった応用プログラムであり、検索したデータ（テキスト、画像、グラフィックス等）の表示や、ブラウジングのデータの表示を行う。

【0011】次に、上記構成のデータベース問い合わせシステムの動作について説明する。図2は、本発明のデータベース問い合わせシステムの動作フローチャートである。

〈ステップS1〉ユーザが起動コマンドによりデータベース部5（データベースシステム）が起動した時点で、データベースの検索のモードに入る。

〈ステップS2〉ユーザが問い合わせ文を入力して、起動コマンドにより問い合わせ処理部3が起動した時点で、問い合わせ処理部3の実行が始まる。問い合わせ文は次のような式で表現される。

【0012】

```
for F
select al, ..., ak
from R1, ..., Rm
where P
```

【0013】ここで、select句、from句、where句は、一般的なSQLのシンタックスに基づいている。これを簡単に説明すると、R1, Rm は、導出される関係である。また、al, ..., akは、これらの関係の属性で、結果として導出されるものである。更に、Pは条件式である。また、for句は、フォーマット指定文であり、後処理を考慮したデータベースの問い合わせのために導入された句である。これは、アプリケーションのフォーマットを指定するためのプログラムを記述する。

【0014】〈ステップS3〉ステップS2で入力した問い合わせ文について問い合わせ処理部3は構文解析を行い、問い合わせ言語の構文にあっているかを検査する。

〈ステップS4〉ステップS2で入力した問い合わせ文について、問い合わせ処理部3はデータベースのスキーマを満たしているかを検査する。ここで、データベースシステムのスキーマとは、データベースのデータ構造の中で時間不変な論理的なものである。

【0015】〈ステップS5〉ステップS2で生成したシステム側の問い合わせ文について、書き換え規則に基づいて、実行プランの生成を行う。

〈ステップS6〉ステップS5で生成した実行プランに従って、実行プランの実行を行う。実行に際しては、データベース部5の実行関数を呼び出すことにより、検索

が行われる。

〈ステップS7〉問い合わせ処理部3は、ステップS6で検索したデータを、ユーザインタフェース管理部2を介して後処理管理部4に渡す。後処理管理部4は渡されたデータを、for句のフォーマットに変換する。

【0016】〈ステップS8〉応用プログラム6は、後処理管理部4で変換されたフォーマットのデータをユーザに表示する。

〈ステップS9〉ユーザが問い合わせ文を再度入力するか否かを判定する。再度入力したら、ステップS3以降の処理を行う。一方、終了ボタンを押したら、データベースの検索モードを終了する。

【0017】〈ステップS10〉ユーザの問い合わせ文が、構文的にエラーであるか、もしくは、データベースのスキーマと比べて意味（セマンチック）的にエラーであれば、問い合わせ処理部3は、ユーザインタフェース管理部2にエラーであることを知らせる。ユーザインタフェース管理部2は、構文エラー、もしくは、意味エラーであることをユーザに知らせる。

【0018】次に、上述した動作を更に具体例を用いて説明する。図3は、データベースのスキーマ構造の説明図である。ここで、データベース部の中のデータは、すべて英文であるとする。obase, geosBib, bibsは、文献データのデータの集まりである。obase というスキーマ構造の中には、author, title, publication, abstract, year, textという属性が含まれる。また、geosBib というスキーマ構造の中には、author, organization, title, publication, comment, year, textという属性が含まれる。また、bibsというスキーマ構造の中には、author, organization, title, publication, keyword, year, textという属性が含まれる。尚、textは、論文の本体を示す属性である。

【0019】〈実行動作1〉ユーザが問い合わせ文を入力する。図4は、その問い合わせ入力画面の説明図である。この例では、1989年度に発行した文献に対する検索を示している。また、for句に“HTML”であることを指定している。これは、データベース部から検索されたデータを、HTMLの形式でインタフェースに渡すプロセスを起動することを示している。尚、HTMLとは、応用プログラム6が受け入れ可能な形式のフォーマットである。

【0020】具体的には、SQLのシンタックスで書くと、次のような問い合わせをしたことを示す。

```
for "HTML"
select *
from id in bibs
where id.year = "1989"
```

【0021】〈実行動作2〉図4において、ユーザが“Query Start”のボタンを押したら、上記ステップS3、ステップS4を行い、構文的、もしくは、意味的に

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エラーであるかをチェックする。

〈実行動作3〉ステップS5、ステップS6を行い、for句の指定に従ってデータの表示を行う。図5は、このときの出力結果であり、検索画面の説明図である。

【0022】次に、上述した実行動作1のfor句の記述だけ、ユーザが変更して、データを表示させる方法を示す。

〈実行動作4〉実行動作1のfor句の“HTML”の代わりに、“tex”とする。尚、この“tex”とは、HTMLと同様に、フォーマットの形式である。

〈実行動作5〉ユーザが“Query Start”のボタンを押したら、ステップS3、ステップS4を行い、構文的、もしくは、意味的にエラーであるかをチェックする。

〈実行動作6〉ステップS5、ステップS6を行い、for句の指定に従ってデータの表示を行う。このとき、データを“tex”の形に整形し、texのプログラムを実行して、texのプレビューが実行され、次のように表示される。図6は、このときの出力結果である。

【0023】以上のように、上記実施例によれば、後処理を問い合わせ言語に埋め込み、問い合わせ言語のfor句で出力先を切り替えることにより、問い合わせの結果を切り替えることができる。また、後処理として、問い合わせの結果を既存のアプリケーションに入力可能な形に変換し、既存プログラムとデータのやり取りを行うプログラムを指定することにより、データベースに対するアクセス手段を持たない既存のアプリケーションを利用することができる。

【0024】尚、上記実施例では、データベース部5が関係データベースシステムである例を説明したが、データベースがオブジェクト指向データベースであっても同様な効果を奏することができる。

【0025】また、上記実施例では、for句に“HTML”を指定して、出力をHTMLに出力した例を示したが、for句にアプリケーションプログラムで用いるフォーマットに変換するプログラム変換プログラムを作成し、for句にそのプログラムを指定することによって、さまざまなデータ形式にも適応可能である。

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【0026】更に、上記実施例では、応用プログラム6へのフォーマット変換を行うために後処理管理部4を独立して設けたが、問い合わせ処理部3がこの後処理管理部4の機能を含むよう構成してもよい。即ち、変換されるフォーマットをユーザが指定して、問い合わせ処理部3が検索実行時に、その検索結果を指定されたフォーマットに変換するよう構成してもよい。

【0027】

【発明の効果】以上説明したように、本発明のデータベース問い合わせシステムによれば、検索結果を利用するアプリケーションのフォーマットをデータベースの問い合わせ文と共に入力し、後処理管理部が、このフォーマット指定文に基づき、検索結果をアプリケーションのフォーマットに変換して出力するようにしたので、データベースの使用を想定していないアプリケーションであってもデータベースの利用を容易に行うことができる。

【図面の簡単な説明】

【図1】本発明のデータベース問い合わせシステムの構成図である。

【図2】本発明のデータベース問い合わせシステムの動作フローチャートである。

【図3】本発明のデータベース問い合わせシステムにおけるデータベースのスキーマ構造の説明図である。

【図4】本発明のデータベース問い合わせシステムにおける問い合わせ入力画面の説明図である。

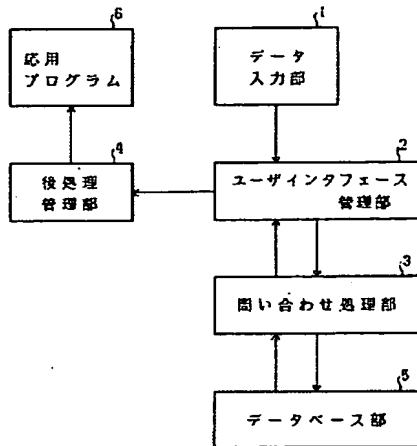
【図5】本発明のデータベース問い合わせシステムにおける検索画面の説明図である。

【図6】本発明のデータベース問い合わせシステムにおける他のフォーマットにおける検索出力結果画面の説明図である。

【符号の説明】

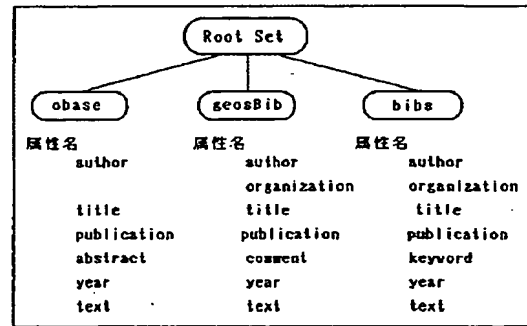
- 1 データ入力部
- 3 問い合わせ処理部
- 4 後処理管理部
- 5 データベース部
- 6 応用プログラム

【図1】



本発明システムの構成部

【図3】



データベースのスキーマ構造の説明図

【図4】

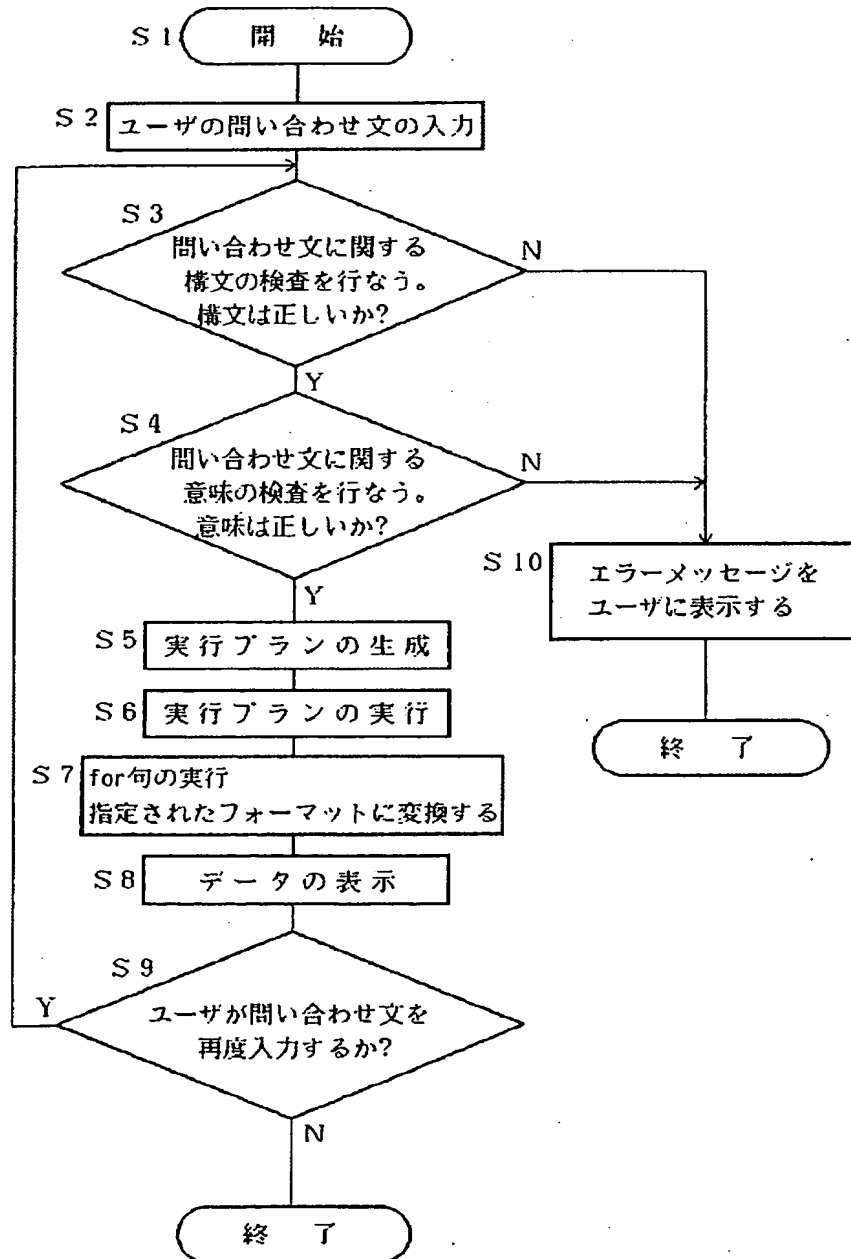
Figure 4 is a screenshot of the inquiry input screen. It shows a window titled '問い合わせ文を入力して下さい' (Please input the inquiry text). Inside the window, there are several input fields and labels:

- A text input field containing 'ETHL'.
- A text input field containing 'id in bibs'.
- A text input field containing 'id.year = "1989"'.

問い合わせ入力画面の説明図

ウィンドウ

【図2】



本発明システムの動作フローチャート

【図5】

検索結果は次の通りです

お問い合わせ窓口へ

author Agraval,R.,Ghani,N.H.,and Srinivasan,J.

title OdeView:The Graphical Interface to Ode

publication Proceedings of the 1990 ACM SIGMOD International Conference on
Management of Data,pp.34-43,May 1990

year 1990

keyword OdeView is the graphical front end for Ode,an object-oriented
database system and environment.Ode's data model supports data
encapsulation,type inheritance,and complex objects.OdeView
provides facilities for examining the database schema(i.e.,the object
type or class hierarchy).

検索画面の説明図

ウィンドウ

スクロールバー

【図6】

検索結果は次の通りです

お問い合わせ窓口へ

Ode View:The Grapical Interface to Ode

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ABSTRACT

OdeView is the graphical front end for Ode,an Object-oriented database system and

...

by it. In This paper, we present OdeView, and discuss its design and implementation.

1. INTRODUCTION

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他のフォーマットでの検索結果画面の説明図

ウィンドウ

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